

Increase Productivity Through Knowledge Management

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Abstract Increase in competition level requires companies to improve the efficiency of work force use characterized by labor productivity. Professional knowledge of staff and its experience play the key role in it. The results of Extrusion Line operator's working time analysis are performed in this article. The analysis revealed that the reasons of working time ineffective use connected with inadequate information exchange and knowledge management in the company. Authors suggest the way to solve this problem: the main sources of knowledge in engineering enterprise have been defined, the conditions of success and the stages of knowledge management control have been stated.

Introduction

The key to success in commodity markets is an open economy and competition by State performance. Cost-effective potential is crucial to reduce production costs of goods, while productivity seems the only source of real economic growth and progress. Efficiency characterizes the level of labor resources utilization, taking into account generation, elapsed time and quality of work, as well as the cost of labor per employee. Output shows the social balance and economic efficiency in terms of labor relations based on the principle of economical expenditure of labor.

Competitiveness is not based on sufficiently high and increasing level of work efficiency; it can only take place at the expense of low or declining average wages and/or income of domestic producers. Explanation of this is the fact that without decrease in time per unit of this unit, the producer would reduce the valuation of unit of this time, in other words, the wage for unit of output. Quantitative characteristic of labor efficiency is labor capacity defined as the ratio of output to the number of employees.

Now, in terms of increasingly competitive world market, every country should maintain the competitive productivity level, at least in key sectors, such as mechanical engineering. In this respect, the level of productivity in Russia requires strong raise and appropriate economic policy. In 2012, presidential decree officially defined the challenge of improving productivity in 1.5 times up to 2018.

However, despite the course, adopted by the State, of increasing efficiency in engineering, there has been a slowdown in the growth of this indicator and productivity reduced by 1.7% in engineering according to federal State statistics service (table 1).

In 2014 the plan of measures ensuring productivity was adopted again and it tasked the government to increase productivity more than 5% annually. In 2015, the President marked the challenge of improving productivity again as a priority at the meeting of the Commission on the monitoring of the achievement of the targets of socio-economic development.



Table 1. The ratio of production index and the index of the change in the number of employed persons by economic activity of the Russian Federation

(% to the previous year)		
	2012	2013
Industrial production	104.2	101.3
including:		
manufacture of machinery and equipment	105.3	98.3

The implementation of these tasks requires state enterprises support of the machine-building complex, community initiatives, associations and unions of producers, in order to promote the search and implementation of best practices and methods, sharing of experiences and learning. According to the experts, the average performance of the industry in the year 2014 is only 2.05 million rubles/person/year.

A great role in increasing the productivity of the enterprise staff plays its professional knowledge and experience, while scientific and technological productivity growth factors are often capabilities realization of which depends on a person. Productivity growth in industrial enterprises at the expense of the development of the human factor is reflected in the works of such scholars as Dutse, A.Y. , Ayuba, B. [1] , Yu, X., Dosi, G. , Lei, J., Nuvolari, A. [3], Yus Kelana, B.W., Abu Mansor, N.N., Ayyub Hassan, M [8], etc. In the works of these scientists, it is noted that both a lack of investment in upgrading the material and technical base of production and in terms of innovation, improving education, intellectual capacity, innovation and creativity of the workforce contributes to increased productivity.

1. The evaluation of efficiency level in the use of labor resources for example, the industrial enterprises of mechanical engineering

Traditional tools, which are used in order to collect and analyze information on the effectiveness of the use of labor resources, include working time of monitoring with construction photos of the working day. Based on these tools, we have carried out the study of the structure of time in an Enterprise Engineering (scope of activity «manufacture of electrical machinery and electrical equipment »), an example of the extrusion line operator to overlay the insulation on the electrical cable.

During the execution of the technological process of blending work insulation the following actions perform:

- carries out preparation of raw materials
- makes it possible to configure and launch the production line,
- monitors and, if necessary, adjustment of technology blending modes and winding insulation product in the drum.

Having a set of measurements on the use of working time operator, we have obtained the results presented in table 2.

Following an analysis of the results obtained, it is possible to identify the following issues driving inefficient use of time:

- Lack of structured storage of semi-finished product coming from previous technological operations takes time to search; lack of consistency when placing a semi-finished product causes loss of time associated with its transportation to the production line, unnecessarily increases the load on the transport mechanisms,
 - Improper layout of equipment, organization of working places requires the expenditure of time, associated with the movement of the operator increases the time of the changeover.
 - Lack of internal regulatory requirements for line speed causes a significant disparity between the formulations that does not correlate with the level of quality of the operation. The speed of the line

is installed a work based on experience within the limited operational documentation on the equipment.

- Lack of structured techniques to conduct control operations, in particular, on the frequency control (it is determined by the operator alone, based on experience and is different for different operators).

Table 2. Structure of the working time of the extrusion line operator to overlay the insulation on the electrical cable.

Activity operator	Function	Type of operation	The time of the operation, %
Preparation of raw materials and materials	Preparation	auxiliary	22
Setting up equipment	Preparation	auxiliary	7
Monitoring/adjustment of the blending process isolation	Cable protection	main	31
Monitoring/adjustment process winding product on the drum	Storage, transport	main	25
Moving operator on the line	-	auxiliary	6
Control operations	Quality control	auxiliary	9

Analyzing the identified problems it may be concluded that their causes lie in the realm of insufficient exchange of information and knowledge management in the enterprise:

- problems with accommodation and finding materials due to insufficient information exchange processes between related technological operations,
- loss of time associated with the movement were due to the lack of information on the process of executing an operation (in particular on the structure of support time) when placing equipment and jobs
- development variation indicators, the amount of time required to perform control operations due to the lack of organization of processes of identification and translation best practices.

On the basis of the foregoing it may be concluded that the company has all the necessary resources to increase productivity, but due to insufficient control of the processes of accumulation and exchange of information, cannot use them.

2. Knowledge management system at the industrial enterprise

By J. Harrington's definition, the information transformed into the ability for effective action is called knowledge.

Knowledge management is a process that aims at creating, sharing and using knowledge to improve the activities and goals of the Organization, with knowledge of the Organization's processes, the specifics of their operation are a kind of skeleton, on which "grow" various types of management information.

The introduction of knowledge management system enables an organization to maintain expertise and provide it for reuse, improve the performance of staff, reduce turnaround time and adaptation period for new specialists.

Knowledge creates a person based on different information resources, it always personally, because man is generated through the prism of their own experience, intellect. Knowledge reflects people's beliefs and values, their skills and professional knowledge as well as their rules, relationships and concepts.

The process of knowledge creation has two levels - empirical and theoretical. Empirical knowledge produced in the course of practical experience, research, observation, experiment. At the theoretical

level occurs generalization of results of cognitive activity, abstraction from the object monitoring, theoretical knowledge is a product of the creative activity of thinking. These levels are interconnected and closely intertwined.

Feature operation knowledge in organizations is their diversity. They may exist in two forms - formalized and non-formalized form.

Formalized knowledge (explicit) is a knowledge that can be described, documented, told other people. People can directly send each other formalized knowledge in the form of text, video, audio, software, etc. stored on real physical media (books, paper documents, drawings, diagrams, films, audio and video recordings, electronic files and databases, etc.).

Some types of knowledge exist implicitly-in the minds of employees, this knowledge cannot be seen or documented, and passing them is possible just through personal and direct communication. The implicit knowledge includes the experience, skill, culture of thinking, intuition.

3. Formation and knowledge management

All types of knowledge described above form the knowledge base of the company.

The machine-building enterprise the following sources of knowledge can be identified, potentially forming the basis of efficiency:

Table 3. Sources of information on the types of knowledge.

Internal sources of information	External sources of information
Empirical knowledge	
The results of the analysis of the structure of time expenses for performance of technological operations; Results of a comparative analysis of the personal efficiency of employees; The results of the implementation of the projects of the development and production of new types of products (reasons for success/failure of such projects, complicating factors, etc.); The results of the aggregate data on quality in all types of control: input, stage-by-stage, acceptance testing, causes of defects), as well as complaints of consumers; Dynamics and structure of marketing; The results of internal audits; The results of the appraisal of staff, identified training needs; Proposals for improvement generated by employees based on experience.	The results of marketing researches; Information on the results of external examinations; Information from the media, Governments, consumers, affecting the functioning of the Organization; The knowledge gained in the training organizations and from experts; Information about the features, parameters and features of operation of equipment from suppliers and manufacturers. Information about the features of use, methods of carrying out the entrance control of raw materials; The experience of industry leaders.
Theoretical knowledge	
Internal regulatory documentation: regulations, standards of enterprise status, organizational and regulatory documentation; Design and technological documentation; Technical documentation that defines the requirements for the operation and maintenance, inspection and measurement equipment, engineering networks.	Legislation Normative and technical documentation Special literature Training organization

Knowledge management process can be represented as a diagram, shown in Figure 1.

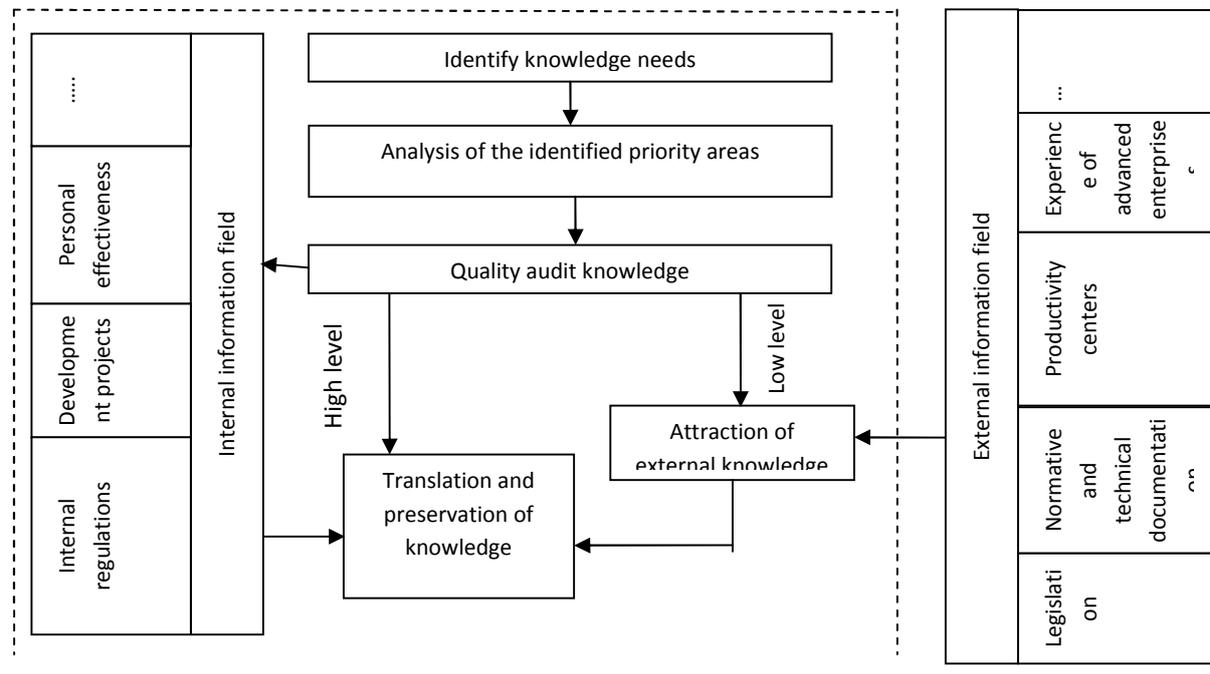


Figure 1. Diagram of knowledge management process

Phase identifying the need for new knowledge involves collection and processing of information on the named source data. For example, an analysis of personal efficiency of employees is carried out to identify staff who consistently demonstrates achievement or even surpassing their goals. This is indicative of the presence of such staff have personal knowledge that the organization needs. Planned to implement projects to successful their realization usually require the formation of new staff knowledge and competency. Performing official duties, the employees of the Organization are often faced with problems whose solution requires additional knowledge. Identifying such needs can be carried out by regular staff surveys, etc.

At the next stage, forming a list of needs in knowledge and operating in an environment of limited resources, the Organization should identify priority needs. Such analysis should take into account the impact of knowledge on the attainment of the objectives of the Organization and the availability of the necessary resources to meet the knowledge needs.

Necessary knowledge can be put at the disposal of the enterprise in the form of lessons learned staff or other sources. However, in order to assess the suitability of the Knowledge Bank for use, it is necessary to conduct an audit of the quality of available knowledge. If the quality level high, the knowledge translation and preservation of existing knowledge.

In case of absence, the source of knowledge (staff) in the Organization, finds the source of knowledge in the environment. The need for knowledge from the environment can be satisfied by the involvement of experts for the execution of works, the training organizations, and recruitment of specialists in other ways.

Translation and preservation of knowledge are to spread knowledge among all staff interested in. Translation and preservation of knowledge can be implemented by:

- Developing a system of training and instruction of personnel that can be received.
- Regular internal master classes and competitions of professional skill.
- Develop a set of internal regulations.
- Development and optimization based on the knowledge needs of corporate information systems.

Factor limiting broadcast knowledge, in addition to the quality of information resources is the competition among workers, in terms of wanting to hide information about the knowledge from colleagues, to achieve higher personal result and gain access to additional resources.

Conclusion

All in all, the exchange and the formation of knowledge exist in any organization, regardless of the will of the leadership. However, only a systematic approach to knowledge management allows organizations ensure the effective functioning of the organization as a whole and manage performance in particular.

It is important to note that the proposed approach to the process of knowledge management will be viable only if certain conditions are met:

- the staff have a desire for new knowledge and willingness to share personal knowledge;
- Defined the format of providing knowledge;
- Developed a clear and fast mechanism for adoption/rejection of knowledge;
- There is no competition for resources among the staff of the organization.

References

- [1] A Y Dutse , B Ayuba Human resource capabilities and FDI-related productivity performance: Experience from Nigeria's indigenous manufacturing firms *Entrepreneurship* **1** (2013) 774-784
- [2] Soltan Hassan and Sherif Mostafa Lean and Agile Performance Framework for Manufacturing Enterprises *Materials Industrial and Manufacturing Engineering* **2** (2015) 476-484
- [3] Yu X G Dosi, J Lei, A Nuvolari Institutional change and productivity growth in China's manufacturing: The microeconomics of knowledge accumulation and "creative restructuring" *Industrial and Corporate Change* **3** (2015) 565-602
- [4] Iuga Virginia and Kifor Claudiu Succesful Lean Manufacturing Implementation: Internal Key Influencing Factors *ACTA Universitatis Cibiniensis* **1** (2015) 121-126
- [5] Anoop C Nair Ramalingam and Ashvini Ravi Knowledge Creation Within the Automobile Industry (2015)
- [6] Fabio Lotti Oliva Knowledge management barriers, practices and maturity model *Journal of Knowledge Management* **6** (2014) 1053 – 1074
- [7] Lu Zhang Lean Production “with Chinese Characteristics” A Case Study of China’s Automobile Industry *International Journal of Sociology* **2** (2015) 152-170
- [8] B W Yus Kelana, N N Abu Mansor, M Ayyub Hassan Does sustainability practices of human resources as a new approach able to increase the workers productivity in the SME sector through human resources policy support *Advanced Science Letters* **5** (2015) 1501-1504
- [9] M Balle Lean attitude considering attitude in lean production *Manufacturing Engineer* (2014)
- [10] Waldemiro Francisco Sorte Junior Standardisation for incremental innovation: a case study in the Brazilian automobile industry *J Lean Enterprise Research* **1** (2014) 81-93